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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is included. (AG)

ED 059283

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

LABORER 8-53.01
FILLING-MACHINE OPERATOR II 7-68.015
LABELER, HAND 9-68.20
LABORER, CONTAINER CAPPING 9-68.10
PACKER II 9-68.30
STAMPER II 9-68.20

S-3 (Formerly B-192)

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U. S. Employment Service in
Cooperation with
California State Employment Service

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S-3

Summary

The GATB, B-1001, was administered to 32 women employed as Assembler and Packager 8-53.01 in the Finishing-Room Department at Cutter Laboratories, Berkeley, California in September 1945. Supervisory ratings were used as the criterion for this study. On the basis of mean scores, standard deviations, job analysis data and their combined selective efficiency, Aptitudes T-Motor Speed, F-Finger Dexterity, and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Assembler and Packager 8-53.01 - S-3

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Assembler and Packager 8-53.01.

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for S-3

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
T	CB-1-G CB-1-K	90	K	Part 8	95
F	CB-1-O CB-1-P	85	F	Part 11 Part 12	80
M	CB-1-M CB-1-N	85	M	Part 9 Part 10	80

Effectiveness of Norms

The data in Table IV indicate that 9 of the 15 poor workers, or 60 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 60 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 14 of the 20 workers who made qualifying test scores, or 70 percent, were good workers.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Assembler and Packager 8-53.01.

II. Sample

The original experimental sample consisted of 35 women employed in the Finishing-Room Department of the Cutter Laboratories, Berkeley, California. All workers performing the Assembler and Packager jobs within the Finishing-Room Department in this plant were tested with the exception of those persons who had language or physical handicaps. The persons tested were treated as a homogeneous population group because they were interchangeable on all the assembly and packaging jobs in this department. Three workers did not complete the tests, leaving a final experimental sample of 32.

In the past, all applicants for jobs as Assembler and Packager have been selected on the basis of an unstandardized interview. The jobs concerned are entry classifications for which no educational or age requirements are set by this plant.

Table II shows the means, standard deviations, ranges, Pearson product-moment correlations (corrected for broad categories) with the criterion, and standard errors of correlation for age, education and experience.

TABLE II

Means (M), Standard Deviations (σ), Ranges, Pearson Product—Moment Correlations (Corrected for Broad Categories) with the Criterion ($_{c}r$) and the Standard Errors of Correlation ($\sigma_{c}r$) for Age, Education, ar Experience

Assembler and Packager 8-53.01

N = 32

	M	σ	Range	$_{c}r$	$\sigma_{c}r$
Age (years)	35.2	13.6	17-56	-.119	.174
Education (years)	10.3	2.0	5-12	-.037	.177
Experience (months)*	13.3	11.1	1-36	-.021	.180

*N = 31. The length of experience was not available for one worker

The data for age and education indicate further that these variables are not operating as selection factors in the hiring of Assemblers and Packagers. The mean number of months spent on the job by this sample is 13, with a standard deviation of 11.1 and a range of 1 to 36 months. This makes it apparent that people have been hired at varying age levels. It should be noted that satisfactory production, as defined by the plant, is usually reached by new workers in three to five weeks. None of the correlations with the criterion is significant.

III. Job Description

Job Title: Assembler and Packager 8-53.01

Job Summary: Bottles medical solutions, packages bottled solutions, and assembles and packages special appliances, such as hypodermic syringes and blood transfusion outfits, by performing any one or combination of the following duties: Adjusts and operates a machine which pumps specified amounts of medical solutions through rubber tubes into bottles. Fills some bottles by siphoning solution from a large glass container. Fills capillary tubes (small glass vials) with smallpox vaccine or allergy-test preparations, using vacuum jar equipment to force liquid into tubes. Sterilizes, dries, and inspects filled capillary tubes. Seals capillary tubes, using an electrically powered sealing machine. Sets sealing machine to load sterilized needles into some capillary tubes before sealing them. Inserts rubber stoppers into bottle containing solutions, and labels and packages the bottles and filled capillary tubes. Assembles and packages special appliances for administering intravenous and subcutaneous injections, blood transfusions, and similar medical and veterinary services.

Work Performed:

Note: The tasks of this job are performed by different workers. The workers are interchangeable and rotate from task to task.

1. Prepares to fill bottles: Adjusts pipetting machine to pump amount specified on filling card by moving power drive belt to proper grooves on gear. Throws switch to start agitator which shakes bottles and prevents a precipitate from being formed in the solution. Places tray of sterilized bottles on work table and pushes bottles under a metal shield, leaving two rows of bottles exposed through opening in top of shield. Sterilizes glass tips of rubber tubes through which liquid is pumped by holding tips over lighted Bunsen burner. Throws switch to start pipetting machine and depresses pedal to pump liquid through tubes.

2. Fills bottles by machine: Places sterilized glass tips of one or two rubber tubes of pipetting machine in bottles into which a specified amount of medical solution is pumped. Pushes tray of filled bottles to next worker who inserts rubber stoppers. Frequently sterilizes tips of tubes during bottling.

3. Siphons solution into bottles: Presses pinch clamp to siphon specified quantity of solution into bottle from large glass container that is above the level of the glass-hooded workbench. Inspects bottle to see if it contains amount of solution specified on filling card.

4. Fills capillary tubes: Places several capillary tubes that have one end sealed in a glass container, open end down. Adds specified quantity of smallpox vaccine or allergy-test preparation, using a pipette, and places container of tubes in vacuum jar. Starts equipment to produce vacuum, then stops it and allows air to enter jar, causing solution to be drawn up into tubes. Removes filled tubes from jar.

5. Sterilizes, dries, and inspects filled tubes: Washes filled capillary tubes in distilled water or diluted antiseptic solution. Spreads tubes on supply truck under electric fan to dry. Inspects tubes under strong local illumination and rejects empty and improperly filled tubes.

6. Seals filled capillary tubes: Loads tubes in capillary-tube-sealing machine. Lights mixture of illuminating gas and oxygen and tends machine as tubes move through it. Removes sealed tubes from machine receptacle. Washes and dries finished tubes and places them on work table for packaging. Rejects improperly sealed tubes.

7. Loads sterilized needles in capillary tubes and seals tubes: Loads capillary-tube-sealing machine with needles and with capillary tubes that have been sealed at one end. Adjusts throw rod, using screwdriver, and starts machine which loads tubes with needles. Removes tubes from machine, spreads them on work table and inspects them, and rejects empty tubes. Places loaded tubes back in machine. Lights burner and starts machine to seal tubes. Removes tubes from machine, washes tubes and places them on work table for packaging.

8. Inserts stoppers, labels and packages bottles and capillary tubes: Arranges supplies of rubber stoppers, paste, labels, and cardboard packages on work-table. Inserts rubber stopper into bottle containing medical solution and turns hood down over lip of bottle to prevent contamination. Stamps dates and serial numbers on labels and packages, using rubber stamps and ink pads. Spreads paste on labels, using brush or applicator, and places labels on bottles. Examines labelled bottles to determine if information agrees with information on finishing card. Inserts labelled bottles into cardboard packages and packs them in cartons for shipment. Similarly packs capillary tubes containing smallpox vaccine or allergy-test preparations. Examines syringes filled with solutions to detect presence of extraneous materials and rejects those which do not meet specifications.

9. Assembles and packages special appliances: Requisitions from stockroom component parts of special appliances for administering intravenous and subcutaneous injections, blood transfusions, and similar medical and veterinary services. Washes and sterilizes parts such as rubber tubing, stainless steel, plastic, and dripmeters, inspecting parts for imperfections, removing extraneous materials, and rejecting those parts which do not meet specifications. Assembles dripmeters, rubber tubing and other parts into finished units and sends them to washroom to be sterilized. Assembles, inspects and tests appliances to assure completeness and proper operation, and packages and labels them to prepare them for shipment.

IV. Experimental Battery

All of the tests of the GATB, B-1001, were administered to the sample group.

V. Criterion

Broad category supervisory ratings were used as the criterion. A set of ratings was made by the Finishing-Room Department Supervisor and one was made by his assistant. Each rater placed the workers in three groups. Letter values were assigned to these groups as follows: A - high, B - middle, and C - low. The supervisors re-rated the workers in the same manner after a laspe of 18 days. The raters were cautioned to give ratings to each examinee in terms of his efficiency in all of the jobs being considered rather than in terms of the specific job in which he spent most of his working time.

The four ratings were combined in the following manner: a worker rated high on each rating received a letter score of AAAA; one rated high three times and middle once received a letter score of AAAB; etc. Ten groups resulted and were assigned letter designations as follows: 5 workers - A; 1 worker - B; 2 workers - C; 2 workers - D; 2 workers - E; 5 workers - F; 4 workers - G; 6 workers - H; 3 workers - I; 2 workers - J. For computational purposes, the letter designations of A through J were converted to numerical values of 65, 59, 58, 56, 54, 51, 48, 43, 38, and 30, respectively.

VI. Statistical and Qualitative Analysis

Table III shows means, standard deviations, Pearson product-moment correlations (corrected for broad categories) with the criterion, and standard errors of correlation for the aptitudes of the GATB. The means and standard deviations of the aptitudes are comparable to general population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ), Pearson Product-Moment Correlations (Corrected for Broad Categories) with the Criterion ($_{o}r$), and Standard Errors of Correlation ($\sigma_{o}r$) for the Aptitudes of the GATB

Assembler and Packager 8-53.01

N = 32

Aptitudes	M	σ	$_{o}r$	$\sigma_{o}r$
G-Intelligence	95.5	16.7	.264	.164
V-Verbal Aptitude	102.2	18.9	.124	.174
N-Numerical Aptitude	92.8	18.5	.211	.169
S-Spatial Aptitude	94.1	17.9	.219	.168
P-Form Perception	90.9	18.0	.269	.164
Q-Clerical Perception	95.4	20.9	.320	.159
A-Aiming	96.6	18.8	.135	.174
T-Motor Speed	101.6	17.6	.064	.176
F-Finger Dexterity	100.2	18.0	.285	.162
M-Manual Dexterity	103.6	19.2	-.100	.175

The statistical results were interpreted in the light of the job analysis data. The job analysis data indicate that the following aptitudes measured by the GATB appear to be important for this occupation.

Motor Speed (T) - required to process materials quickly without spillage or breakage.

Finger Dexterity (F) - required to manipulate small articles, such as needles and capillary tubes.

Manual Dexterity (M) - required in the rapid handling and packaging of supplies.

The highest mean scores were obtained for Aptitudes V, T, F, and M. All of the aptitudes, with the exception of Aptitude Q, have standard deviations of less than 20. The smallest standard deviation (16.7) was obtained for Aptitude G.

When N = 32, correlations of .349 and .449 are significant at the .05 level and .01 level, respectively. None of the aptitudes show significant correlation with the criterion.

Aptitudes T, F, and M, which show job analysis and statistical evidence of importance, were chosen for inclusion in the norms. The cutting score for Aptitude M was set at one standard deviation below the mean and rounded to the nearest five-point score level. The cutting scores for Aptitudes T and F were set five points higher than one sigma below their respective means and rounded to the nearest five-point score levels. Cutting scores were set at these points in order to maximize the selective efficiency of the norms. The resulting norms consist of T-90, F-85 and M-85.

VII. Concurrent Validity of Norms

The criterion was dichotomized for the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion, and applying the Chi Square test. Those workers rated G, H, I, and J were placed in the low criterion group. Table IV shows the relationship between test norms consisting of T-90, F-85, and M-85 and the dichotomized criterion. Workers in the high criterion group have been designated as "good workers" and those in the low criterion group as "poor workers."

TABLE IV

Relationship Between Test Norms Consisting of Aptitudes T, F, and M with Critical Scores of 90, 85, and 85, Respectively and the Criterion for Assembler and Packager 8-53.01

N = 32

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	3	14	17
Poor Workers	9	6	15
Total	12	20	32

$r_{tet} = .65$ $\quad X^2 = 4.426$

$\sigma_{r_{tet}} = .28$ $\quad P/2 < .025$

The data in the above table indicate a significant relationship between the test norms and the criterion for this sample.

VIII. Conclusions

On the basis of all the foregoing considerations, Aptitudes T, F, and M with minimum scores of 90, 85, and 85, respectively are recommended as B-1001 norms for Assembler and Packager 8-53.01. The equivalent B-1002 norms consist of K-95, F-80, and M-80.